Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Use of Spectrum Bands Above 24 GHz For Mobile Radio Services	)	GN Docket No. 14-177
	)	
	)	
Amendment of Parts 1, 22, 24, 27, 74, 80, 90, 95, and 101 To Establish Uniform License Renewal, Discontinuance of Operation, and Geographic Partitioning and Spectrum Disaggregation Rules and Policies for Certain Wireless Radio Services	)	WT Docket No. 10-112

REPLY COMMENTS OF STARRY, INC.

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REPLY COMMENTS OF STARRY, INC.

Starry, Inc. (Starry)[1] respectfully submits these reply comments highlighting the strong record support for quick Federal Communications Commission (FCC or Commission) action to finalize the rules for licensed shared access in the 37-37.6 GHz band (Lower 37 GHz Band or Band). As the record demonstrates, there is significant interest in the use of this Band for fixed and mobile broadband, internet-of-things, industrial uses, and federal uses. If the Commission finalizes the rules in the near-term, the Commission can leverage low-barrier access to spectrum in this Band to significantly enhance the United States' efforts to lead the world in 5G.

Starry urges the Commission to continue to work collaboratively with all stakeholders to craft effective coordination and licensing rules that are technologically neutral and evolve over time to bring this spectrum online in the next 12 months, and to continue to work expeditiously with the National Telecommunications and Information Administration (NTIA), federal users, and commercial users to develop an effective and predictable sharing mechanism to activate true federal and commercial sharing.

[1] Starry, Inc., is a Boston- and New York-based technology company that is utilizing millimeter waves to re-imagine last-mile broadband access as an alternative to fixed wireline broadband. Starry is currently deploying its proprietary fixed 5G wireless technology in the Boston, Washington, DC, and Los Angeles areas, with plans to expand to our presence to additional U.S. cities in 2018.

I. THE RECORD DEMONSTRATES STRONG SUPPORT FOR QUICK ACTION TO FINALIZE SIMPLE AND IMPLEMENTABLE SHARING RULES THAT EVOLVE OVER TIME

Commenters in response to the *Frontiers Third R&O and FNPRM*[2] overwhelmingly support the Commission's proposal to use simple coordination and licensing mechanisms to make the Lower 37 GHz Band available for shared access in the near term.[3] The Commission's 5G agenda has two core components – spectrum and infrastructure.[4] The Commission has made great progress on both, and can make significant strides in its 5G spectrum agenda to maximize the United States' ability to capitalize on all that 5G will offer by quickly finalizing the rules for this Band.

Commenters strongly support moving forward with predictable rules in the near term that promote low-barrier access for all potential users. AT&T applauds the Commission moving forward with shared use in the Band, and urges the Commission to adopt a sharing regime that is flexible and allows deployment on an expedited basis.[5] Federated Wireless (Federated) "urges the Commission to expeditiously facilitate access to [the Lower 37 GHz Band] by adopting a coordination mechanism that will enable initiation of operations at the earliest opportunity through automation and dynamic coordination technologies."[6] The Dynamic Spectrum Alliance (DSA) applauds the Commission's decision to affirm that the Lower 37 GHz Band will be available on a shared basis and suggests coordination rules that will promote fast and low-cost coordination.[7] The Wireless Internet Service Providers Association (WISPA) suggests that

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[2] *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services; Amendment of Parts 1, 22, 24, 27, 74, 80, 90, 95, and 101 To Establish Uniform License Renewal, Discontinuance of Operation, and Geographic Partitioning and Spectrum Disaggregation Rules and Policies for Certain Wireless Radio Services*, Third Report and Order, Memorandum Opinion and Order, and Third Further Notice of Proposed Rulemaking, GN Docket No. 14-177, WT Docket No. 10-112 at ¶¶ 37-40 (rel. June 8, 2018) (*Frontiers Third R&O and FNPRM*).

[3] Comments of AT&T, WT Docket No. 14-177 *et al.* (filed Sept. 10, 2018) (AT&T Comments); Comments of the Wireless Internet Service Provider Association, WT Docket No. 14-177 *et al.* (filed Sept. 10, 2018) (WISPA Comments); Comments of the Dynamic Spectrum Alliance, WT Docket No. 14-177 *et al.* (filed Sept. 10, 2018) (DSA Comments); Comments of Federated Wireless, Inc., WT Docket No. 14-177 *et al.* (filed Sept. 10, 2018) (Federated Comments); Comments of the Competitive Carriers Association, WT Docket No. 14-177 *et al.* (filed Sept. 10, 2018) (CCA Comments); Comments of the Telecommunications Industry Association, WT Docket No. 14-177 *et al.* (filed Sept. 10, 2018) (TIA Comments); Comments of the Open Technology Initiative at New America, WT Docket No. 14-177 *et al.* (filed Sept. 10, 2018) (OTI Comments).

[4] *See* Ajit Pai, Chairman, FCC, *5G is In Reach. But Only if We Set the Right Policies*, WASHINGTON POST, Sept. 27, 2018; https://www.washingtonpost.com/opinions/5g-is-in-reach-but-only-if-we-set-the-right-policies/2018/09/26/9d5c322e-c1c7-11e8-8f06-009b39c3f6dd_story.html?utm_term=.a84ed35bd06a. *See also* The FCC's 5G FAST Plan (rel. Sept. 28, 2018), https://www.fcc.gov/document/fccs-5g-fast-plan.

[5] AT&T Comments at 7-9.

[6] Federated Comments at 1-2.

[7] DSA Comments at 1-2.

"adopting relatively straight-forward sharing and coordination rules within the already proposed framework, the Commission can allow for near-term use of the band to help facilitate the deployment of high-capacity fixed wireless broadband."[8] And the Open Technology Institute at New America (OTI) recognizes that simple coordination in the near term will allow for immediate use of the Band, which will pave the way for more automated frequency coordination.[9]

And several commenters, including Federated, WISPA, and OTI agree that the Commission should continue to iterate on the sharing rules to enhance them using dynamic databases and other tools over time.[10] As Federated notes, the coordination mechanism must "be responsive to the emergence of new use cases and the densification of operations in the band, and thus must contemplate dynamically coordinating and facilitating the most intensive spectrum use possible."[11]

Ultimately, the Commission can enhance its 5G agenda by bringing this spectrum online in the near-term, adding additional capacity and low-barrier access for new and innovative uses. The Commission has established a millimeter wave (mmW) auction cadence that will bring bands to the marketplace in two tranches over the next 12 months.[12] By the end of 2019, the Commission is planning to auction and license nearly five gigahertz of spectrum. The Commission can add to this effort by finalizing the sharing rules for the Lower 37 GHz Band and making it available on the same timeline. This will allow all stakeholders to access the Band, and even allow auction winners to plan systems that can natively incorporate the Lower 37 GHz Band without hardware or software updates, or changes to a network planning strategy.

In addition, quick action will – on the same timeline – bring fixed wireless providers and new and innovative users into mmW spectrum, multiplying the impact of exclusively-licensed spectrum. The Commission should keep the momentum and quickly finalize the licensing and coordination rules within the next 12 months, activating this spectrum to the benefit of consumers, business, and the U.S. economy.

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[8] WISPA Comments at 1-2.

[9] OTI Comments at 5.

[10] *See* DSA Comments; OTI Comments; Federated Comments.

[11] Federated Comments at 3-4.

[12] *See* Ajit Pai, Chairman, FCC, *Coming Home*, FCC Blog, July 11, 2018; https://www.fcc.gov/newsevents/blog/2018/07/11/coming-home.

II. THE SHARING RULES SHOULD BE TECHNOLOGICALLY NEUTRAL AND SHOULD REFLECT REALISTIC TECHNICAL CHARACTERISTICS

The record demonstrates support for the Commission's proposed licensing and coordination rules, with suggested improvements and modifications.[13] Importantly, as the Commission considers the specifics of licensing and coordination, it should maintain its strong historical stance on technological neutrality, and should look realistically to the impact of indoor and outdoor systems to ensure effective coexistence if it enables distinct licensing between both.

A. The Evolution of the Coordination and Licensing Rules Should Avoid Prescribing Any Specific Technology Solution

Qualcomm argues that the Commission should craft coordination rules that enable a potentially forthcoming 3GPP 5G New Radio-Unlicensed/Shared Spectrum (5G NR-U/SS) standard for coordination in the Lower 37 GHz Band.[14] This standard reportedly uses a sensing/beaconing technique to coordinate spectrum access across disparate systems.[15] If the Commission decides to explore the use of sensing/beaconing technologies, it should do so in a truly technologically neutral manner that will allow for not only disparate systems to coordinate, but also different technologies using different standards and different waveforms – deployed by both commercial and federal users – to coordinate. Most importantly, the development of technologically neutral rules for sensing/beaconing-enabled sharing should not delay access to this Band – there are users ready to access this spectrum now, and we encourage the Commission to activate it within the next 12 months.

In general, Starry agrees that a sensing/beaconing solution could be implemented over time as the Commission continues to enhance the rules and coordination methodology; Starry has advocated for such a solution several times in this proceeding.[16] As Starry has described on the record, a sensing/beaconing system that is conceptually derived from the 802.11 standard (but not specifically an implementation of it) offers sophisticated sensing and beaconing techniques to implement a listen-before-talk protocol enhanced with request to send/clear to send

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[13] *See* AT&T Comments; WISPA Comments; TIA Comments; Federated Comments; OTI Comments; Joint Comments of Intel Corporation and Cisco Systems, Inc., WT Docket No. 14-177 *et al.* (filed Sept. 10, 2018) (Intel/Cisco Comments).

[14] Comments of Qualcomm Incorporated, WT Docket No. 14-177 *et al*. at 7-13 (filed Sept. 10, 2018) (Qualcomm Comments).

[15] *Id.* at 8-13.

[16] Starry, Inc. *Ex Parte*, WT Docket No. 14-177 *et al.* (filed July 5, 2016) (describing a media access control reservation system); Comments of Starry, Inc., WT Docket No. 14-177 *et al.* (filed Sept. 27, 2016) (describing the use of beaconing systems, previously raised, to dynamically coordinate access to the Band); Starry, Inc. *Letter*, WT Docket No. 14-177 *et al.* (filed July 14, 2017) (explaining the Commission could take a two phased approach to sharing, with simple coordination in the first phase and the use of dynamic tools, like beaconing in the second phase).

synchronization to share traditionally unlicensed spectrum resources. It is an effective, well-known, lightweight, and low-cost solution that leverages spectrum access in both the frequency and time dimensions.

While 5G NR/U-SS might allow similar systems to share, we note that the standard is not yet complete and the technical details are uncertain. As described by Qualcomm, its proposed medium access control synchronization would rely on a "predefined signature waveform."[17] There is no information on how, if at all, the standard would accommodate different systems using different standards and different waveforms. We note that the specification of a waveform in the Commission's rules would inherently not be technologically neutral, as the transmission of a specific waveform may require the implementation of a particular radio technology or standard.

If the Commission considers the use of sensing/beacon-based sharing, we strongly encourage the adoption of rules that would require a technologically neutral beaconing protocol that is divorced from a specific standard. It should not matter whether a device or network implements a 3GPP standard, an IEEE standard, a bespoke protocol for a federal agency, or uses some new innovative radio technology that is "non-standard." The Commission should explore in detail the operation and coexistence of 5G NR/U-SS, 802.11, and any other similar sensing and beaconing technology that could be implemented to create rules that do not inadvertently prescribe the use of a specific standard or proprietary technology.

For the U.S. to capitalize on the 5G opportunity, the Commission should adopt rules that enable the proliferation of a robust and diverse ecosystem of 5G services, providers, and technologies. Rules that benefit one technology – or ecosystem – over another will foreclose innovation and stifle investment.

B. Indoor-Outdoor Coordination Could be Enabled in This Band, But Should Use Appropriate Technical Protections to Promote Coexistence

DSA, OTI, and Intel/Cisco all suggest some form of licensing and coordination that would incorporate indoor or property-level access.[18] Consistent with our contention that the Commission can enhance its 5G efforts through lower-barrier access, we suggest the Commission consider these options within the context of promoting predictability in the

[17] Qualcomm Comments at 12.

[18] *See* DSA Comments; OTI Comments; Intel/Cisco Comments.

interference environment and maximizing realistic coexistence between geographic and property-oriented licenses.

We believe that if the Commission begins sharing in this Band based on simple coordination that it enhances over time, the distinction between geographic or property-based licensing dissolves. And, even the Commission's near-term licensing and coordination proposals, with enhancements suggested on the record, can enable both geographic and property-based sharing. This is especially true if the coordination methodology accounts for characteristics of a specific deployment. For example, Starry's suggested coordination process that relies on simple propagation analysis[19] could be further enhanced by adding variables for indoor versus outdoor operations, information about building materials, or other elements to model indoor or property-level operations.

Based on our own testing, we generally believe that this type of sharing could be implemented in the Band if the coexistence rules reflect the type of propagation users would expect to see in the real world. Millimeter wave spectrum does attenuate significantly, but variably, through building materials. Anticipating protection levels can be difficult because of the different levels of attenuation depending on the type of material – the signals attenuate more through concrete than timber, for instance. Different window types offer another variable – signals attenuate significantly through modern low emissivity glass, but much less so through century-old glass panes (often seen in historical districts in Boston, for example).

In order to enable this type of sharing, we suggest the Commission further enhance the record by seeking technical analyses to derive the appropriate protection criteria for indoor and outdoor systems. Intel/Cisco suggest that coexistence be based on an assumed isolation level of 45 dB derived from assumed "well-engineered energy-efficient" buildings.[20] Based on Starry's own testing, and recognizing the variability in building types, we suggest that any such modeling assume much less isolation, closer to 30 dB to adequately protect outdoor licensees.

We also note the difference between indoor and outdoor licensing, versus geographic and property-based licensing. We appreciate Intel/Cisco's end goal of creating a low-barrier path to spectrum access for a variety of industrial users, and share that goal. However, we believe it could be achieved using the proposed licensing and coordination scheme (with modifications)

[19] *See* Comments of Starry, Inc., WT Docket No. 14-177 *et al.* at 6-9 (filed Sept. 10, 2018).

[20] Intel/Cisco Comments at 22.

and predictable ways to authorize indoor – instead of property-level – licensing and deployment. Creating a distinction between indoor and outdoor operations makes technical and operational sense, given the propagation losses through building materials.[21] But outdoor operations that are licensed at the property level disregard the difficulty in designing a network in which transmissions respect the property boundary. Again, as the sharing techniques for this Band evolve, this type of sharing can be incorporated through sensing/beaconing or database-enabled sharing. In the near term, however, it can best be achieved through a distinction focused on the natural barriers between license areas – specifically the exterior wall of a building.

In the near-term, the Commission could use other tools to enhance coexistence between indoor and outdoor systems. It could enable indoor use through Part 15, which would reduce the total power to a level that would make transmissions much more likely to stay contained within the physical indoor space.[22] In addition to enabling service under Part 15, the Commission could also require indoor Lower 37 GHz Band devices to be positioned facing inward if within a certain distance from an exterior wall or window to better ensure that the indoor system does not cause harmful interference to the outdoor system, for example.

We encourage the Commission to continue to develop the record on this type of sharing to craft predictable rules that enhance and maximize the utility of the Band for all uses.

C. The Commission Should Disregard Continued and Untimely Arguments About Exclusive Licensing in This Band

Despite the Commission's conclusive reaffirmation of its decision to make this Band available on a licensed shared basis, T-Mobile continues to attempt to re-litigate the point.[23] The Commission very clearly established that this Band will be available on a licensed shared basis, and importantly, also established its commitment to continuing to work with federal agencies to facilitate their shared access to the Band.[24] The record strongly supports the Commission moving forward with shared access in the Lower 37 GHz Band.[25]

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[21] Intel/Cisco argue that "buildings, building walls, and intervening clutter/obstructions play an elevated role in defining wireless coverage areas for this regime." Intel/Cisco Comments at 1-2.

[22] *See* OTI Comments at 10-12.

[23] Comments of T-Mobile USA, Inc., WT Docket No. 14-177 *et al.* at 12-13 (filed Sept. 10, 2018).

[24] *Frontiers Third R&O and FNPRM* at ¶¶ 37-40, 66-67.

[25] *See* AT&T Comments; CCA Comments; WISPA Comments; OTI Comments; Federated Comments; DSA Comments; TIA Comments.

The Commission has many tools to authorize the use of radio frequencies under its broad authority granted by Sections 301 and 309 of the Telecommunications Act of 1996.[26] The Commission issues licenses with varying levels of protections without holding auctions on a daily basis for operations authorized under Part 90, Part 101, and other FCC rule parts.[27] The record overwhelmingly shows support from across the wireless ecosystem for the Commission to lead collaborative effort to think constructively about the appropriate rules for sharing in the Band – we encourage the Commission to do so.

III. THE COMMISSION SHOULD CONTINUE TO WORK WITH NTIA, FEDERAL STAKEHOLDERS, AND COMMERCIAL STAKEHOLDERS TO DEVELOP PREDICTABLE AND EFFECTIVE FEDERAL/COMMERCIAL SHARING

The record demonstrates measured concern about the federal use cases that may perpetuate in this Band over time, with many commenters arguing for, at a minimum, predictability about the federal use.[28] We believe the Commission and the NTIA can address these concerns through a continued public dialogue with all stakeholders. Ultimately, we believe that through collaboration with all stakeholders, the Commission and NTIA can develop a coordination tool that can provide federal users meaningful access to the 37 GHz band, consistent with the co-primary allocation, in the near- and long-term.

While we understand the National Academy of Sciences Committee on Radio Frequencies' desire to maximize the protection of its interests in this Band, its suggested time-based sharing would severely restrict non-federal use of the Band.[29] While time-based sharing can be used as a tool to activate another dimension of sharing, it needs to use a timescale that allows all users to meaningfully operate. Time-based sharing where one party can preempt another's use for minutes at a time, several times a day, creates a super-primary right that would foreclose the use of the Band by any provider offering any consumer-oriented service. Its infeasible to shut down a system for minutes a day in order to provide absolute protection to

[26] 47 U.S.C. §§ 301, 309.

[27] *See* FCC Weekly Status Public Notices (listing the weekly Public Notices issued announcing applications accepted for filing or acted upon), https://www.fcc.gov/uls/public-notices/list?field_uls_public_notice_type_tid=1891; 47 C.F.R. § 90.173; 90.175; 101.1523. The Commission has granted *over 5,500* licenses under Part 101 without auction this year. *See* Universal Licensing System, Granted Licenses as of Sept. 28, 2018 in Radio Service Codes MG, MM. We also note that Starry's suggestion that applications filed within the first 24 hours of the opening of the window be treated as filed concurrently will not create mutual exclusivity as they must be coordinated.

[28] *See* AT&T Comments at 10-11; Comments of CTIA-The Wireless Association, WT Docket No. 14-177 *et al*. at 14-16 (filed Sept. 10, 2018); CCA Comments at 7.T-Mobile Comments at 9-11, 15-16.

[29] Comments of the National Academy of Sciences' Committee on Radio Frequencies, WT Docket No. 14-177 *et al*. at 11 (filed Sept. 7, 2018).

another operation. This is especially true for systems that use the Lower 37 GHz Band as the primary or only band to support an operation or service – in such a case, any service that requires any level of quality-of-service or near real-time operation would be precluded.

Again, we believe that if the Commission facilitates stakeholder collaboration, we can quickly develop a coordination method that works for all parties, and bring this Band to bear to help make the U.S. a world leader in 5G.

IV. CONCLUSION

Starry respectfully requests that the Commission activate the Lower 37 GHz Band through effective and relatively simple sharing rules in the next 12 months, continue to iterate and enhance sharing over time, and base the coordination and licensing regime on technologically neutral rules.

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